MP MASTER

MA29867

SCIENTIFIC-ATLANTA, INC.

P. O. BOX 13654, ATLANTA 24, GEORGIA (3845 Pleasantdale Road — at NE Expressway)

Telephone 404-938-2930 • TWX: 404-938-1322 • WUX • Cable SCIATLA

INSTRUCTION MANUAL
POSITIONER INDICATOR
SERIES PI 2
SERIAL NO. _____

First Edition

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## SERIES PI2 POSITIONER INDICATOR


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# I. GENERAL DESCRIPTION

## 1.1 Introduction

Scientific-Atlanta, Inc., Series PI 2 Positioner Indicator assemblies may be used with any positioner which has a 36:1 synchro output. The 360 degree indicator dials are calibrated in 10 degrees increments with a vernier dial calibrated in 0.2 degree increments. A coordinate selector switch on models P12-1 (one indicator assembly) permits connection of the indicator to either of three synchro transmitter circuits. On model P12-2, two indicator assembly, one indicator is fixed in the azimuth circuit, the second indicator can be switched between the elevation and auxiliary synchro transmitter circuits. Model P12-3 has an indicator in each of the three synchro transmitter circuits.

## 1.2 Specifications

| | |
|---|---|
| Input, synchro | 3 type AN connectors for three synchro transmitter units. |
| Input, ac power | 1 type AN connector for ac to indicator and synchro transmitter units. |
| Output, synchro | 3 type AN connectors to supply synchro information to recorders. |
| Indicators | |
| Model P12-1 | One 23TR6 geared 36:1 to 360° dial. |
| Model P12-2 | Two 23TR6's geared 36:1 to 360° dial. |
| Model P12-3 | Three 23TR6's geared 36:1 to 360° dial. |
| Synchro Protection | Fuse, type 3AG, located on front panel. (see section 2.2 for rating) |

## II. OPERATION

### 2.1 CONTROLS

A. POWER: DS-1 indicates ac power is being supplied to the assembly. F-1 is located in the ac circuit which supplies power to the front panel indicators and to the synchro transmitter units located in the positioner. See section 2.2 for fuse rating.

B. INDICATORS: Type 23TR6 synchro receiver with a 360 degree dial calibrated in 10 degrees increments with a vernier dial calibrated in 0.2 degree increments. A slip clutch arrangement on each indicator permits setting the dials to correspond with the antenna positioner orientation.

C. COORDINATE SELECTOR: This switch permits one indicator to be connected in one of three synchro transmitters circuits on model PI2-1 and in one of two synchro transmitter circuits on model PI2-2.

### 2.2 FUSE RATING

The front panel fuse (F-1) provides protection for the indicator and the synchro transmitters. A rule of thumb rating for this fuse is 1/4 ampere per synchro: Thus,

| No. of Indicator | No. of Synchro Transmitter Units* | Suggested Fuse rating |
|---|---|---|
| 1 | *1 | 1 |
| 1 | *2 | 1 1/2 |
| 1 | *3 | 2 |
| 2 | *2 | 1 1/2 |
| 2 | *3 | 2 |
| 3 | *3 | 2 1/2 |

* There are normally two synchros per synchro transmitter unit.

## III. DETAILED DESCRIPTION

### 3. 1 Physical Description

The Scientific-Atlanta, Inc. Series PI 2 Positioner Indicator assemblies are single panel mounting units, 5 1/4 inches high, 19 inches wide, and 9 inches deep.

### 3. 2 Circuit Description

The Positioner Indicator assemblies, Series PI 2 permits synchro information from as many as three antenna positioner synchro transmitter units to be displayed on synchro receiver indicators.

A. Model PI2-1

The circuit diagram for the model PI2-1, one indicator assembly is shown by figure 1. AC for the rotor windings of the indicator synchros and for external synchro transmitters connected to J-1, J-2 or J-3 is obtained from pins A and B of P-4. P-4 is normally connected to J-3 of the Series PC2, Positioner Control Units. 36:1 and 1:1 synchro information from J-1, J-2 and J-3 is connected to the recorder outputs, P-1, P-2 and P-3 respectively. 36:1 synchro information from windings S1 and S2 of all three synchro transmitters is connected to the COORDINATE SELECTOR switch, S-1. The output of S-1 is connected to the appropriate windings of the synchro indicator.

B. Model PI2-2

The circuit diagram for the model PI2-2, two indicator assembly is shown by figure 2. Connections and operation for this model is the same as for the model PI2-1 except that the azimuth synchro indicator is directly connected to the azimuth synchro transmitter circuit. The second synchro indicator only can be switched by the COORDINATE SELECTOR switch to either the elevation or auxiliary synchro transmitter circuit.

C. Model PI2-3

The circuit diagram for the model PI2-3, three indicator assembly is shown by figure 3. Connections and operation for this model is the same as for the model PI2-1 except that there is no COORDINATE SELECTOR switch. The synchro indicators are directly connected to their respective synchro transmitter circuits.

## 3.3 Synchro Transmitter Connections

External synchro transmitter units should be connected to the Series PI 2 Position Indicators as follows:

To J-1, J-2, or J-3 connect

Pin A or B to $R_1$ of 1:1 and 36:1 Synchros
Pin C to $R_2$ of 1:1 and 36:1 Synchros
Pin D to $S_2$ of 1:1 Synchro
Pin E to $S_1$ of 1:1 Synchro
Pin F to $S_1$ of 36:1 Synchro
Pin G to $S_2$ of 36:1 Synchro
Pin H to $S_3$ of 1:1 and 36.1 Synchros

## IV. TABLE OF PARTS

### MANUFACTURERS' CODE LETTERS

| CODE | MANUFACTURER |
|---|---|
| GE | General Electric Company |
| L | Littlefuse, Inc. |
| AP | Airpax Products Company |
| SA | Scientific-Atlanta, Inc. |
| CJ | Cinch-Jones Sales Div., Cinch Manufacturing Corporation |
| CRL | Centralab Div. of Globe-Union Inc. |
| DL | Dialight Corporation |

## IV. TABLE OF PARTS

### SERIES PI2 POSITIONER INDICATOR

| Component Designation | Description | Mfr.* | Mfr. Part No. |
|---|---|---|---|
| DS-1 | Lamp pilot | GE | NE 51 |
| F-1 | Fuse, type 3AG, 2 ampere max. (see section 2.2) | LF | 31200Z |
| J-1<br>J-2<br>J-3 | Connector, type AN | AP | 97-3102A-20-7S |
| P-1<br>P-2<br>P-3 | Connector, type AN | AP | 97-3102A-20-7P |
| P-4 | Connector, type AN | AP | 97-3102A-14S-2P |
| PI-1 | Indicator, position | SA | Model 420 |
| TB-1<br>TB-2 | Terminal Strip | CJ | 8-140 |
| *S-1 | Switch, rotary, shorting | CRL | PA-2002 |
| TB-3 | Terminal Strip | CJ | 12-140 |
| XDS-1 | Socket, pilot lamp | DL | 521308-991 |

* not used on model PI2-3

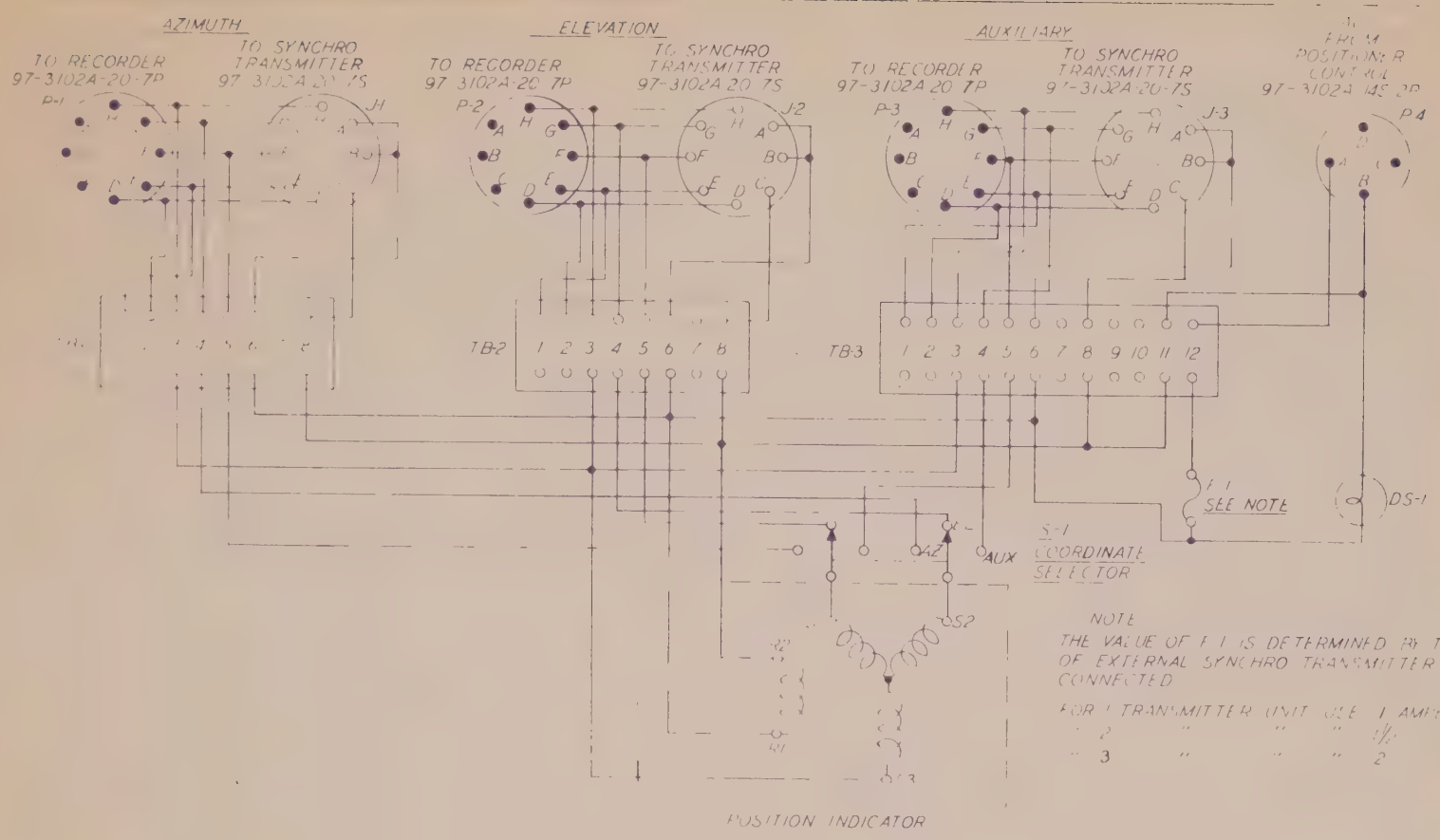
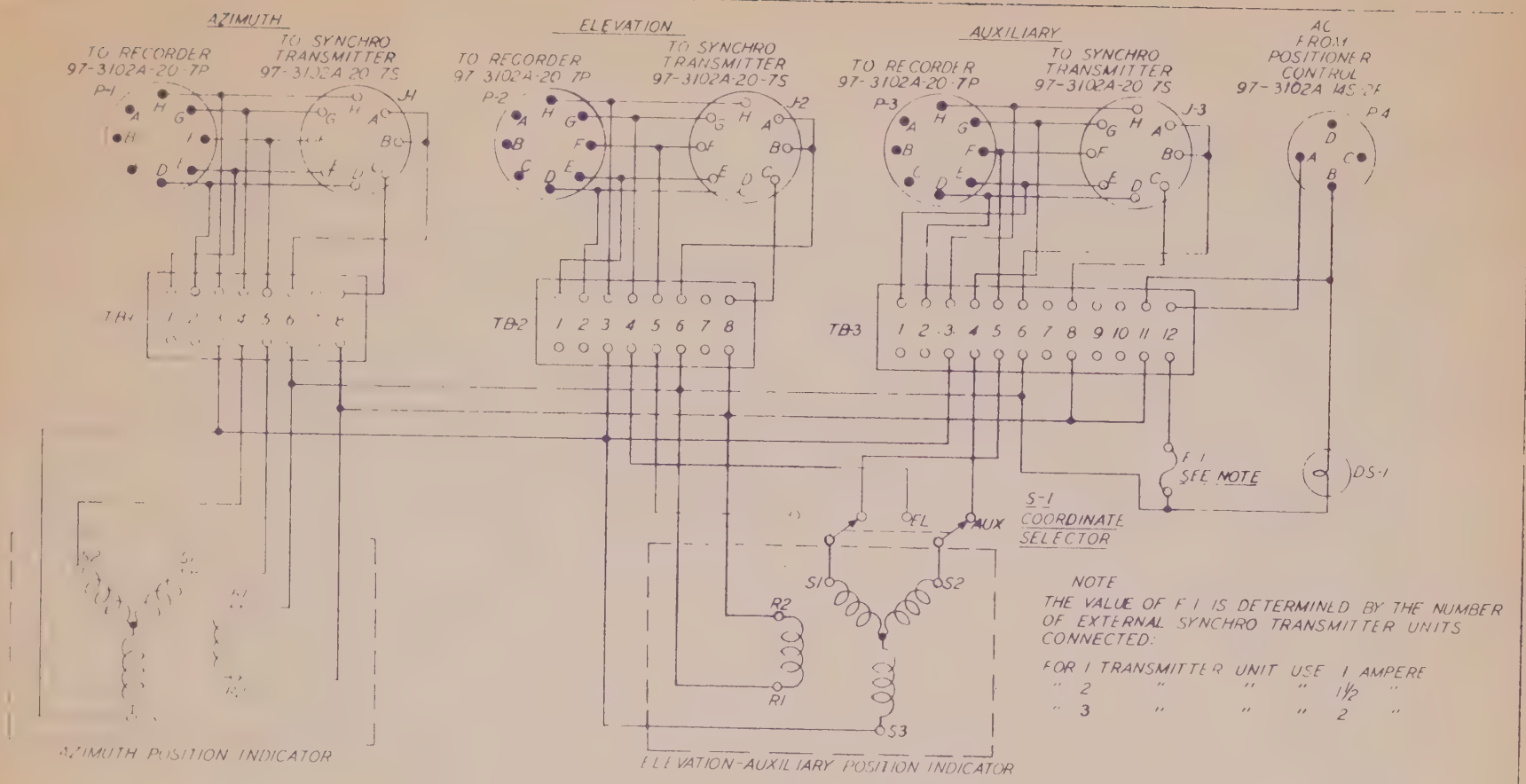



FIGURE 1. CIRCUIT DIAGRAM MODEL PI2-1




NOTE
THE VALUE OF F-1 IS DETERMINED BY THE NUMBER OF EXTERNAL SYNCHRO TRANSMITTER UNITS CONNECTED:

FOR 1 TRANSMITTER UNIT USE 1 AMPERE
" 2 " " " 1½ "
" 3 " " " 2 "

FIGURE 2. CIRCUIT DIAGRAM MODEL PI 2-2

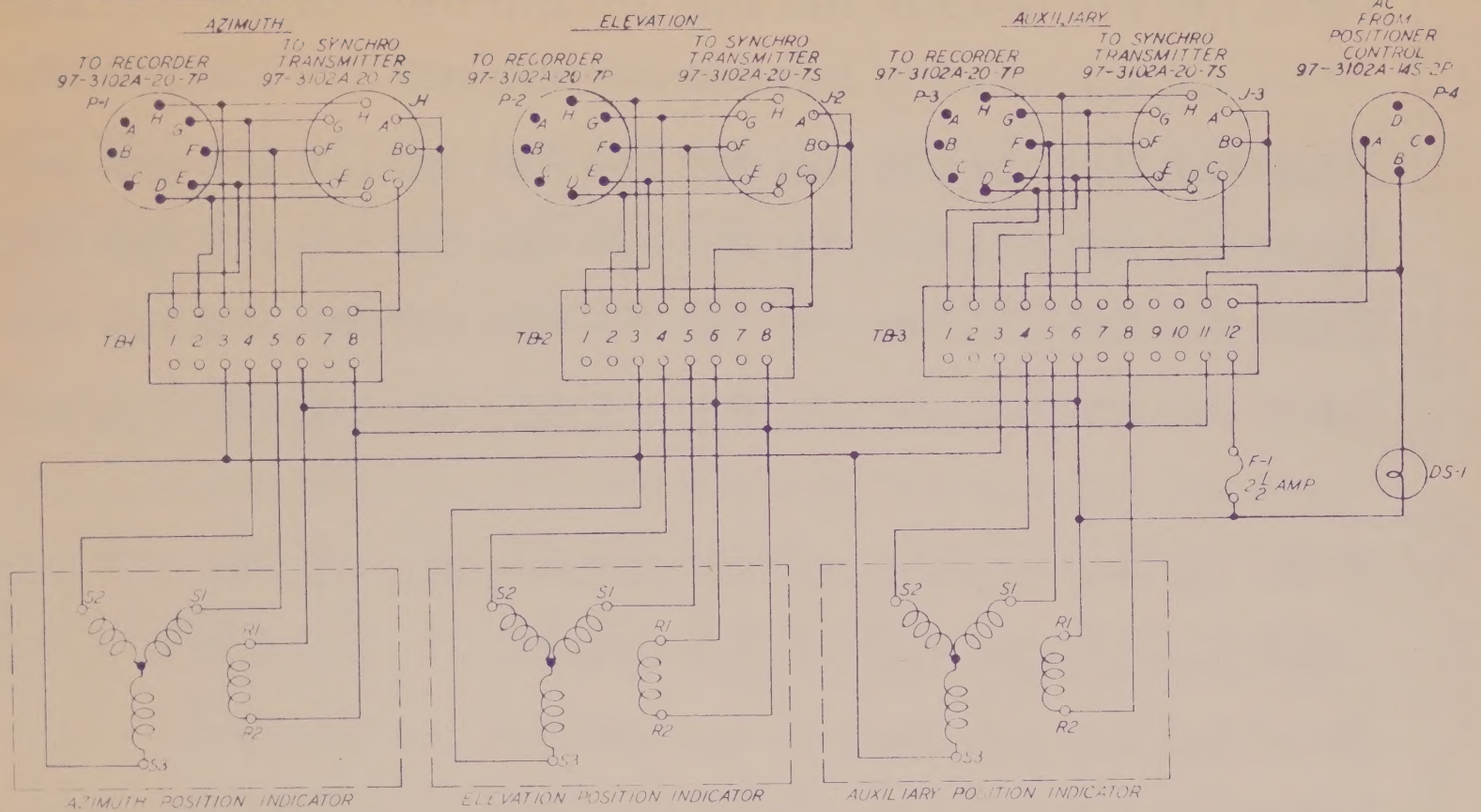



FIGURE 3. CIRCUIT DIAGRAM MODEL PI23

# CONVERSION OF VOLTAGE AND POWER RATIOS TO DECIBELS

The basic chart below indicates the number of decibels (db) corresponding to the listed ratios of voltage or power over the range of −20 to +20 db. For voltage or power ratios greater than those included in the chart, the ratio can be broken down into a product of two numbers, the value in db for each found separately, and the two results added. Example: To convert a power ratio of 2,000:1 to db, express 2,000 as $2 \times 10^3$; the number of db corresponding to a power ratio of 2 is very nearly 3, and the number of db for a power ratio of $10^3$ is 30. Therefore, the power ratio of 2,000:1 is approximately 30 db + 3 db = 33 db. In the lower right-hand corner of the chart db values for voltage and power ratios of integral powers of 10 are given.

| Voltage Ratio | Power Ratio | −db+ | Voltage Ratio | Power Ratio | Voltage Ratio | Power Ratio | −db+ | Voltage Ratio | Power Ratio | Voltage Ratio | Power Ratio | −db+ | Voltage Ratio | Power Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.000** | **1.000** | **0** | **1.000** | **1.000** | **.447** | **.200** | **7.0** | **2.239** | **5.012** | **.200** | **.0398** | **14.0** | **5.012** | **25.12** |
| .989 | .977 | .1 | 1.012 | 1.023 | .442 | .195 | 7.1 | 2.265 | 5.129 | .197 | .0389 | 14.1 | 5.070 | 25.70 |
| .977 | .955 | .2 | 1.023 | 1.047 | .437 | .191 | 7.2 | 2.291 | 5.248 | .195 | .0380 | 14.2 | 5.129 | 26.30 |
| .966 | .933 | .3 | 1.035 | 1.072 | .432 | .186 | 7.3 | 2.317 | 5.370 | .193 | .0372 | 14.3 | 5.188 | 26.92 |
| .955 | .912 | .4 | 1.047 | 1.096 | .427 | .182 | 7.4 | 2.344 | 5.495 | .191 | .0363 | 14.4 | 5.248 | 27.54 |
| .944 | .891 | .5 | 1.059 | 1.122 | .422 | .178 | 7.5 | 2.371 | 5.623 | .188 | .0355 | 14.5 | 5.309 | 28.18 |
| .933 | .871 | .6 | 1.072 | 1.148 | .417 | .174 | 7.6 | 2.399 | 5.754 | .186 | .0347 | 14.6 | 5.370 | 28.84 |
| .923 | .851 | .7 | 1.084 | 1.175 | .412 | .170 | 7.7 | 2.427 | 5.888 | .184 | .0339 | 14.7 | 5.433 | 29.51 |
| .912 | .832 | .8 | 1.096 | 1.202 | .407 | .166 | 7.8 | 2.455 | 6.026 | .182 | .0331 | 14.8 | 5.495 | 30.20 |
| .902 | .813 | .9 | 1.109 | 1.230 | .403 | .162 | 7.9 | 2.483 | 6.166 | .180 | .0324 | 14.9 | 5.559 | 30.90 |
| **.891** | **.794** | **1.0** | **1.122** | **1.259** | **.398** | **.159** | **8.0** | **2.512** | **6.310** | **.178** | **.0316** | **15.0** | **5.623** | **31.62** |
| .881 | .776 | 1.1 | 1.135 | 1.288 | .394 | .155 | 8.1 | 2.541 | 6.457 | .176 | .0309 | 15.1 | 5.689 | 32.36 |
| .871 | .759 | 1.2 | 1.148 | 1.318 | .389 | .151 | 8.2 | 2.570 | 6.607 | .174 | .0302 | 15.2 | 5.754 | 33.11 |
| .861 | .741 | 1.3 | 1.161 | 1.349 | .385 | .148 | 8.3 | 2.600 | 6.761 | .172 | .0295 | 15.3 | 5.821 | 33.88 |
| .851 | .724 | 1.4 | 1.175 | 1.380 | .380 | .145 | 8.4 | 2.630 | 6.918 | .170 | .0288 | 15.4 | 5.888 | 34.67 |
| .841 | .708 | 1.5 | 1.189 | 1.413 | .376 | .141 | 8.5 | 2.661 | 7.079 | .168 | .0282 | 15.5 | 5.957 | 35.48 |
| .832 | .692 | 1.6 | 1.202 | 1.445 | .372 | .138 | 8.6 | 2.692 | 7.244 | .166 | .0275 | 15.6 | 6.026 | 36.31 |
| .822 | .676 | 1.7 | 1.216 | 1.479 | .367 | .135 | 8.7 | 2.723 | 7.413 | .164 | .0269 | 15.7 | 6.095 | 37.15 |
| .813 | .661 | 1.8 | 1.230 | 1.514 | .363 | .132 | 8.8 | 2.754 | 7.586 | .162 | .0263 | 15.8 | 6.166 | 38.02 |
| .804 | .646 | 1.9 | 1.245 | 1.549 | .359 | .129 | 8.9 | 2.786 | 7.762 | .160 | .0257 | 15.9 | 6.237 | 38.90 |
| **.794** | **.631** | **2.0** | **1.259** | **1.585** | **.355** | **.126** | **9.0** | **2.818** | **7.943** | **.159** | **.0251** | **16.0** | **6.310** | **39.81** |
| .785 | .617 | 2.1 | 1.274 | 1.622 | .351 | .123 | 9.1 | 2.851 | 8.128 | .157 | .0246 | 16.1 | 6.383 | 40.74 |
| .776 | .603 | 2.2 | 1.288 | 1.660 | .347 | .120 | 9.2 | 2.884 | 8.318 | .155 | .0240 | 16.2 | 6.457 | 41.69 |
| .767 | .589 | 2.3 | 1.303 | 1.698 | .343 | .118 | 9.3 | 2.917 | 8.511 | .153 | .0234 | 16.3 | 6.531 | 42.66 |
| .759 | .575 | 2.4 | 1.318 | 1.738 | .339 | .115 | 9.4 | 2.951 | 8.710 | .151 | .0229 | 16.4 | 6.607 | 43.65 |
| .750 | .562 | 2.5 | 1.334 | 1.778 | .335 | .112 | 9.5 | 2.985 | 8.913 | .150 | .0224 | 16.5 | 6.683 | 44.67 |
| .741 | .550 | 2.6 | 1.349 | 1.820 | .331 | .110 | 9.6 | 3.020 | 9.120 | .148 | .0219 | 16.6 | 6.761 | 45.71 |
| .733 | .537 | 2.7 | 1.365 | 1.862 | .327 | .107 | 9.7 | 3.055 | 9.333 | .146 | .0214 | 16.7 | 6.839 | 46.77 |
| .724 | .525 | 2.8 | 1.380 | 1.905 | .324 | .105 | 9.8 | 3.090 | 9.550 | .145 | .0209 | 16.8 | 6.918 | 47.86 |
| .716 | .513 | 2.9 | 1.396 | 1.950 | .320 | .102 | 9.9 | 3.126 | 9.772 | .143 | .0204 | 16.9 | 6.998 | 48.98 |
| **.708** | **.501** | **3.0** | **1.413** | **1.995** | **.316** | **.100** | **10.0** | **3.162** | **10.000** | **.141** | **.0200** | **17.0** | **7.079** | **50.12** |
| .700 | .490 | 3.1 | 1.429 | 2.042 | .313 | .0977 | 10.1 | 3.199 | 10.23 | .140 | .0195 | 17.1 | 7.161 | 51.29 |
| .692 | .479 | 3.2 | 1.445 | 2.089 | .309 | .0955 | 10.2 | 3.236 | 10.47 | .138 | .0191 | 17.2 | 7.244 | 52.48 |
| .684 | .468 | 3.3 | 1.462 | 2.138 | .306 | .0933 | 10.3 | 3.273 | 10.72 | .137 | .0186 | 17.3 | 7.328 | 53.70 |
| .676 | .457 | 3.4 | 1.479 | 2.188 | .302 | .0912 | 10.4 | 3.311 | 10.96 | .135 | .0182 | 17.4 | 7.413 | 54.95 |
| .668 | .447 | 3.5 | 1.496 | 2.239 | .299 | .0891 | 10.5 | 3.350 | 11.22 | .133 | .0178 | 17.5 | 7.499 | 56.23 |
| .661 | .437 | 3.6 | 1.514 | 2.291 | .295 | .0871 | 10.6 | 3.388 | 11.48 | .132 | .0174 | 17.6 | 7.586 | 57.54 |
| .653 | .427 | 3.7 | 1.531 | 2.344 | .292 | .0851 | 10.7 | 3.428 | 11.75 | .130 | .0170 | 17.7 | 7.674 | 58.88 |
| .646 | .417 | 3.8 | 1.549 | 2.399 | .288 | .0832 | 10.8 | 3.467 | 12.02 | .129 | .0166 | 17.8 | 7.762 | 60.26 |
| .638 | .407 | 3.9 | 1.567 | 2.455 | .285 | .0813 | 10.9 | 3.508 | 12.30 | .127 | .0162 | 17.9 | 7.852 | 61.66 |
| **.631** | **.398** | **4.0** | **1.585** | **2.512** | **.282** | **.0794** | **11.0** | **3.548** | **12.59** | **.126** | **.0159** | **18.0** | **7.943** | **63.10** |
| .624 | .389 | 4.1 | 1.603 | 2.570 | .279 | .0776 | 11.1 | 3.589 | 12.88 | .125 | .0155 | 18.1 | 8.035 | 64.57 |
| .617 | .380 | 4.2 | 1.622 | 2.630 | .275 | .0759 | 11.2 | 3.631 | 13.18 | .123 | .0151 | 18.2 | 8.128 | 66.07 |
| .610 | .372 | 4.3 | 1.641 | 2.692 | .272 | .0741 | 11.3 | 3.673 | 13.49 | .122 | .0148 | 18.3 | 8.222 | 67.61 |
| .603 | .363 | 4.4 | 1.660 | 2.754 | .269 | .0724 | 11.4 | 3.715 | 13.80 | .120 | .0145 | 18.4 | 8.318 | 69.18 |
| .596 | .355 | 4.5 | 1.679 | 2.818 | .266 | .0708 | 11.5 | 3.758 | 14.13 | .119 | .0141 | 18.5 | 8.414 | 70.79 |
| .589 | .347 | 4.6 | 1.698 | 2.884 | .263 | .0692 | 11.6 | 3.802 | 14.45 | .118 | .0138 | 18.6 | 8.511 | 72.44 |
| .582 | .339 | 4.7 | 1.718 | 2.951 | .260 | .0676 | 11.7 | 3.846 | 14.79 | .116 | .0135 | 18.7 | 8.610 | 74.13 |
| .575 | .331 | 4.8 | 1.738 | 3.020 | .257 | .0661 | 11.8 | 3.890 | 15.14 | .115 | .0132 | 18.8 | 8.710 | 75.86 |
| .569 | .324 | 4.9 | 1.758 | 3.090 | .254 | .0646 | 11.9 | 3.936 | 15.49 | .114 | .0129 | 18.9 | 8.811 | 77.62 |
| **.562** | **.316** | **5.0** | **1.778** | **3.162** | **.251** | **.0631** | **12.0** | **3.981** | **15.85** | **.112** | **.0126** | **19.0** | **8.913** | **79.43** |
| .556 | .309 | 5.1 | 1.799 | 3.236 | .248 | .0617 | 12.1 | 4.027 | 16.22 | .111 | .0123 | 19.1 | 9.016 | 81.28 |
| .550 | .302 | 5.2 | 1.820 | 3.311 | .246 | .0603 | 12.2 | 4.074 | 16.60 | .110 | .0120 | 19.2 | 9.120 | 83.18 |
| .543 | .295 | 5.3 | 1.841 | 3.388 | .243 | .0589 | 12.3 | 4.121 | 16.98 | .108 | .0118 | 19.3 | 9.226 | 85.11 |
| .537 | .288 | 5.4 | 1.862 | 3.467 | .240 | .0575 | 12.4 | 4.169 | 17.38 | .107 | .0115 | 19.4 | 9.333 | 87.10 |
| .531 | .282 | 5.5 | 1.884 | 3.548 | .237 | .0562 | 12.5 | 4.217 | 17.78 | .106 | .0112 | 19.5 | 9.441 | 89.13 |
| .525 | .275 | 5.6 | 1.905 | 3.631 | .234 | .0550 | 12.6 | 4.266 | 18.20 | .105 | .0110 | 19.6 | 9.550 | 91.20 |
| .519 | .269 | 5.7 | 1.928 | 3.715 | .232 | .0537 | 12.7 | 4.315 | 18.62 | .104 | .0107 | 19.7 | 9.661 | 93.33 |
| .513 | .263 | 5.8 | 1.950 | 3.802 | .229 | .0525 | 12.8 | 4.365 | 19.05 | .102 | .0105 | 19.8 | 9.772 | 95.50 |
| .507 | .257 | 5.9 | 1.972 | 3.890 | .227 | .0513 | 12.9 | 4.416 | 19.50 | .101 | .0102 | 19.9 | 9.886 | 97.72 |
| **.501** | **.251** | **6.0** | **1.995** | **3.981** | **.224** | **.0501** | **13.0** | **4.467** | **19.95** | **.100** | **.0100** | **20.0** | **10.000** | **100.00** |
| .496 | .246 | 6.1 | 2.018 | 4.074 | .221 | .0490 | 13.1 | 4.519 | 20.42 | | | | | |
| .490 | .240 | 6.2 | 2.042 | 4.169 | .219 | .0479 | 13.2 | 4.571 | 20.89 | | $10^{-3}$ | 30 | | $10^3$ |
| .484 | .234 | 6.3 | 2.065 | 4.266 | .216 | .0468 | 13.3 | 4.624 | 21.38 | $10^{-2}$ | $10^{-4}$ | 40 | $10^2$ | $10^4$ |
| .479 | .229 | 6.4 | 2.089 | 4.365 | .214 | .0457 | 13.4 | 4.677 | 21.88 | | | | | |
| | | | | | | | | | | | $10^{-5}$ | 50 | | $10^5$ |
| .473 | .224 | 6.5 | 2.113 | 4.467 | .211 | .0447 | 13.5 | 4.732 | 22.39 | $10^{-3}$ | $10^{-6}$ | 60 | $10^3$ | $10^6$ |
| .468 | .219 | 6.6 | 2.138 | 4.571 | .209 | .0437 | 13.6 | 4.786 | 22.91 | | $10^{-7}$ | 70 | | $10^7$ |
| .462 | .214 | 6.7 | 2.163 | 4.677 | .207 | .0427 | 13.7 | 4.842 | 23.44 | $10^{-4}$ | $10^{-8}$ | 80 | $10^4$ | $10^8$ |
| .457 | .209 | 6.8 | 2.188 | 4.786 | .204 | .0417 | 13.8 | 4.898 | 23.99 | | $10^{-9}$ | 90 | | $10^9$ |
| .452 | .204 | 6.9 | 2.213 | 4.898 | .202 | .0407 | 13.9 | 4.955 | 24.55 | | | | | |
| | | | | | | | | | | $10^{-5}$ | $10^{-10}$ | 100 | $10^5$ | $10^{10}$ |
| | | | | | | | | | | | $10^{-11}$ | 110 | | $10^{11}$ |
| | | | | | | | | | | $10^{-6}$ | $10^{-12}$ | 120 | $10^6$ | $10^{12}$ |

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